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KATHRYN A MARRA
General Motors Corporation
Legal Staff, Mail Code 482-C23-B21
P.O. Box 300
Detroit, MI 48265-3000

EXAMINER
MERKLING, MATTHEW J

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/763,951	Applicant(s) JOHNSON ET AL.	
	Examiner Matthew J. Merkling	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 October 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7 and 9-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7 and 9-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/30/07 has been entered.

Claim Objections

2. Claim 10 objected to because of the following informalities:

It appears a typographical error was made in the dependency of claim 10. Claim 10 should be dependent from claim 9, as was indicated in the amended claims of 6/25/07, and not from claim 19, as indicated in the amended claims of 10/30/07. For purposes of this examination, claim 10 will be examined as depending from claim 9.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the

art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-3, 9, 10 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368) in view of Zhou (US 6,500,969) and Li et al. (US 6,782,892) and further evidenced by Kinkade (US 4,994,498).

Regarding claims 1, 9 and 10, Becker discloses:

A fluidized-bed oxidation reactor comprising:

a chamber (Fig. 1 (1)) defining a hollow interior region and having a lower surface (4);

a first input (6) for introducing a gas into the hollow interior region;

a plurality of particles (2) within the hollow interior region and located on the lower surface (4), and;

a fluidizing input (10) for introducing a fluidizing material into the hollow interior region (gas, paragraph 32 lines 4-5), said fluidizing input having an outlet directed at the lower surface of the chamber (see Fig. 1 (10), paragraph 26 lines 3-5). The entry of gas into a bed of catalyst will fluidize at least a portion of an already fluidized bed.

Furthermore, regarding limitations which are directed to a manner of operating disclosed system, neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP §2114 and 2115. Further, process limitations do not have a patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that

states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim.

While Becker teaches the catalyst containing metal (paragraph [0032]) such as gold, Becker fails to teach the plurality of catalysts as being nanoparticles.

Zhou also discloses an oxidation process (as does Becker) and the type of catalyst used in said oxidation process.

Zhou teaches nanoparticles comprising a metal (col. 8 lines 33-43) being utilized as the catalyst in an oxidation reaction in order to ensure high activity and selectivity of desired oxidation products (col. 5 lines 34-43).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the nanoparticles of Zhou in the fluidized bed oxidation reactor of Becker in order to ensure high activity and selectivity of the desired oxidation products.

Modified Becker teaches nano-sized oxidation catalyst in the range of 0.5 to 100nm (see Zhou, claim 15), but is silent on particle sizes in the range of 15-25nm.

Li also discloses a nanosized oxidation catalyst.

Li teaches a nanocatalyst used for oxidation with a particle size of 25nm as a preferable way of oxidizing a reactant (col. 8 lines 55-61).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a particle diameter of 25nm, as in Li, in the catalyst of modified Becker as a known size of nanoparticle to oxidize a reactant.

Furthermore, regarding the size of the particles, it was well known in the art at the time of the invention that the particle size of the catalyst in a fluidized bed is a variable that is routinely varied to achieve the desired performance (see Kinkade, col. 7 lines 51-59). As such the size of the catalyst particles is not considered to confer patentability to the claim. The size of the particles would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the claimed size of the catalyst particles cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the size of the catalyst particles in modified Becker to obtain the desired fluidized bed performance (In re Boesch, 617 F. 2d. 272,205 USPQ 215 (CCPA 1980)). Since it has been held that where general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 223).

Regarding claim 2, Becker, further discloses that the nanoparticles will be fluidized by the inlet of gas from the first inlet (paragraph 32 lines 4-8).

Regarding claim 3, Becker further discloses a fluidized-bed chamber comprising a port (Fig. 1, (8)) for the exit of the decontaminated gas out of the hollow interior region (paragraph 35 line 9).

Regarding claim 21, Becker discloses a method of removing contaminants from a contaminated gas comprising:

A fluidized-bed oxidation reactor comprising:

a chamber (Fig. 1 (1)) defining a hollow interior region and having a lower surface (4);

a first input (6) for introducing a gas into the hollow interior region;

a plurality of particles (2) within the hollow interior region and located on the lower surface (4), and;

a fluidizing input (10) for introducing a fluidizing material into the hollow interior region (gas, paragraph 32 lines 4-5), said fluidizing input having an outlet directed at the lower surface of the chamber (see Fig. 1 (10), paragraph 26 lines 3-5). The entry of gas into a bed of catalyst, such as through input 10 of Becker, will fluidize at least a portion of an already fluidized bed.

Becker fails to teach the plurality of catalysts as being nanoparticles.

Zhou also discloses an oxidation process (as does Becker) and the type of catalyst used in said oxidation process.

Zhou teaches nanoparticles being utilized as the catalyst in an oxidation reaction in order to ensure high activity and selectivity of desired oxidation products (col. 5 lines 34-43).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the nanoparticles of Zhou in the fluidized bed oxidation reactor of Becker in order to ensure high activity and selectivity of the desired oxidation products. (as noted above) and further discloses introducing a recycle/contaminated gas into the hollow interior region (paragraph 32). Becker also discloses introducing a fluidizing material (gas, paragraph 35 lines 6-7) directed at the lower surface (see Fig. 1 (10)).

Modified Becker teaches nano-sized oxidation catalyst in the range of 0.5 to 100nm (see Zhou, claim 15), but is silent on particle sizes in the range of 15-25nm.

Li also discloses a nanosized oxidation catalyst.

Li teaches a nanocatalyst used for oxidation with a particle size of 25nm as a preferable way of oxidizing a reactant (col. 8 lines 55-61).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a particle diameter of 25nm, as in Li, in the catalyst of modified Becker as a known size of nanoparticle to oxidize a reactant.

Furthermore, regarding the size of the particles, it was well known in the art at the time of the invention that the particle size of the catalyst in a fluidized bed is a variable that is routinely varied to achieve the desired performance (see Kinkade, col. 7 lines 51-59). As such the size of the catalyst particles is not considered to confer patentability to the claim. The size of the particles would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the claimed size of the catalyst particles cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the size of the catalyst particles in modified Becker to obtain the desired fluidized bed performance (In re Boesch, 617 F. 2d. 272,205 USPQ 215 (CCPA 1980)). Since it has been held that where general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 223).

5. Claims 4, 5, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969) and Li et al. (US 6,782,892) as applied to claims 3 and 21 above, and further in view of Alford et al. (US 6,887,291).

Regarding claims 4, 5, 22 and 23 the modified Becker discloses a fluidized catalyst (2) in a reaction bed with an exit port (8) for the gas that has reacted, but does not teach the claimed nanoparticle separation from the effluent gas method and apparatus comprising:

a second input for introducing a backpressure pulse of gaseous material into the hollow interior region through the port, or

a gas permeable separation device in communication with said port and the exit of gas from the hollow interior region through the gas permeable separation device for separating catalyst nanoparticles and causing them to collect upon the gas permeable separation device and where the entrance of the backpressure pulse displaces the collected catalyst nanoparticles.

Alford discloses a filter device for removing nanomaterials from gas streams using a gas permeable separating device (Fig.1 (2), see Abstract).

Alford teaches a second input (5) for introducing a backpressure pulse (pulse jet) of gaseous material into a hollow interior region (10) (col. 7 lines 59-67) in order to clean a filter (col. 7 lines 43-55). Alford also teaches a gas permeable separation device (filter, 2) in communication with a hollow interior region (10) and the second input (5) and the entrance for introducing a backpressure pulse

(pulse jet) into the hollow interior region (10) displacing collected catalyst nanoparticles (col. 7 lines 43-55). Alford teaches this in order to allow catalyst nanoparticles to be collected by said gas permeable separation device (filter) and to clean said gas permeable separation device of said catalyst nanoparticles (col. 7 lines 35-67).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the backpressure pulse input of Alford with the fluidized bed oxidation reactor with nanoparticles of the modified Becker in order to clean the filter that is used to separate the nanoparticles from the gas stream with the second input. Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the gas permeable separation device (in communication with the second input) and the entrance of the backpressure pulse into the hollow interior region to displace the collected nanoparticles of Alford, with the fluidized bed oxidation reactor of the modified Becker in order to allow catalyst nanoparticles to be collected by said gas permeable separation device and to clean said gas permeable separation device of said catalyst nanoparticles.

6. Claims 7 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969), Li et al. (US 6,782,892), and Alford et al. (US 6,887,291) as applied to claims 5 and 23 above, and further in view of Ballantine et al. (US 2006/0078771).

Regarding claims 7 and 24, modified Becker, as discussed in claims 5 and 23 above, discloses a vessel with two 'competing inlets' (process inlet and fluidizing inlet, competing with backpressure pulse inlets). By the term 'competing inlets', the examiner is referring to two independent inlets that are injecting fluid into the same space. Modified Becker, however, does not disclose a specific control strategy utilized by a control device that synchronizes the backpressure pulse valve with the first input valve.

Ballantine discloses a series of controlled valves introducing multiple fluid inlets to the same process space.

Ballantine teaches a valve synchronization process of closing an inlet valve (402) connected to a vessel (412) when a second inlet valve (401) is opened in order to prevent backflow through the first process valve (paragraph 42)

It would have been obvious to one of ordinary skill in the art at the time of the invention to change the control scheme of the valve controller in modified Becker to synchronize the valve opening of the second inlet with the valve opening of the first inlet such that when the second inlet valve opens, the first inlet valve closes in order to prevent back flow through the first inlet valve, as is taught by Ballantine.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969) and Li et al. (US 6,782,892) as applied to claim 1 above, and further in view of Goswami (US 5,933,702).

Regarding claim 6, the modified Becker discloses all of the claims limitations, as discussed with respect to claim 1 above, but does not teach a humidifier in communication with the first input (gas inlet).

Goswami also discloses a photocatalytic/oxidation reactor for reacting a gas to remove contaminants via oxidation.

Goswami discloses a humidifier (Fig. 1 (50)) on the gas inlet (18) to a photocatalytic/oxidation reactor (21) in order to provide the correct relative humidity for the complete oxidation and destruction of a microorganism in the photocatalytic/oxidation reactor (col. 7 line 60 – col. 8 line 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the humidifier and photocatalytic/oxidation reactor of Goswami with the fluidized bed oxidation reactor of Becker in order to ensure the correct humidity for the complete oxidation and destruction of said microorganisms.

8. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969) and Li et al. (US 6,782,892) as applied to claim 1 above, and further in view of Wu (US 2002/0187082).

Regarding claims 11 and 12, the modified Becker discloses all of the claim's limitations as discussed in claim 1 above, but fails to teach an ultraviolet light as well as the ultraviolet light within the hollow interior region of the chamber.

Wu teaches a photocatalytic/oxidation reactor (Fig. 3(a) (315)) which uses photocatalysts to treat polluted air.

Wu also teaches an ultraviolet light (320) in order to facilitate chemical reactions in photocatalysis (paragraph 8, lines 1-4). Wu further teaches said ultraviolet light being positioned within the hollow interior of the chamber (315). It is well known in the art that positioning the ultraviolet light inside the reactor or chamber maximize the exposure of the photocatalyst or the photoactive material, as is shown by Sanderson (US 2005/0079124, paragraph 113).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the internally positioned ultraviolet light of Wu with fluidized bed oxidation reactor of the modified Becker in order to facilitate chemical reactions in photocatalysis and maximize the exposure of the photocatalyst.

9. Claims 11 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969) and Li et al. (US 6,782,892) as applied to claim 1 above, and further in view of Sato (US 6,812,470).

Regarding claims 11 and 13, the modified Becker discloses all of the claims limitations, as discussed in claim 1 above, but fails to teach the ultraviolet light positioned outside of the chamber/reactor.

Sato also discloses a photocatalytic/oxidation reactor chamber (Fig. 2 (50)).

Sato teaches an ultraviolet light (80) positioned outside of the reactor chamber in order to facilitate preventing the ultraviolet light from overheating by using a fan blowing external air (col. 5 lines 18-24).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the external ultraviolet light of Sato with the

photocatalytic/oxidation reactor of the modified Becker in order to facilitate prevention of the ultraviolet light overheating by using a fan blowing external air.

10. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969), Li et al. (US 6,782,892) and Wu (US 2002/0187082) as applied to claim 11 above, and further in view of Goswami (US 5,933,702).

Regarding claim 14, the modified Becker discloses all of the claims limitations, as discussed in claim 11 above, but does not teach a humidifier in communication with the first input (gas inlet).

Goswami teaches a photocatalytic/oxidation reactor for reacting a gas to remove contaminants.

Goswami also teaches a humidifier (Fig. 1 (50)) on the gas inlet (18) to a photocatalytic/oxidation reactor (21) in order to provide the correct relative humidity for the complete oxidation and destruction of a microorganism in the photocatalytic reactor (col. 7 line 60 – col. 8 line 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the humidifier and photocatalytic/oxidation reactor of Goswami with the fluidized bed photocatalytic/oxidation reactor of the modified Becker in order to ensure the correct humidity for the complete oxidation and destruction of said microorganisms.

11. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969), Li et al. (US 6,782,892) and Wu (US 2002/0187082) as applied to claim 11 above, and further in view of Sherman (US 6,653,356).

Regarding claim 15, the modified Becker teaches all of the claim's limitations as discussed in claim 11 above, but does not disclose groups included in the photocatalytic material.

Sherman teaches the production of photocatalytic nanoparticles and describes uses therein, such as its anti-microbial (catalytic oxidation) properties.

Sherman also teaches that a type of photocatalytic material to be used on nanoparticles is titanium dioxide in order to save costs and leverage anti-microbial effects in the presence of ultraviolet light (Abstract and paragraph 4).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the titanium dioxide nanoparticles of Sherman with the oxidation/photocatalytic reactor and the nanoparticles of the modified Becker in order to save costs and leverage antimicrobial effects in the presence of ultraviolet light.

12. Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969), Li et al. (US 6,782,892) and Wu (US 2002/0187082) as applied to claim 11 above, and further in view of Wei et al. (US 2005/0129591).

Regarding claims 16 and 17, the modified Becker discloses all of the claims limitations as discussed in claim 11 above, but does not teach a nanoparticle comprising a metal oxide and a co-catalyst.

Wei discloses a photocatalyst for air quality treatment (see title).

Wei teaches a nanoparticle photocatalyst that contains a metal oxide (titanium oxide) in order to destroy contaminants in an air purifier (paragraph 3 lines 1-2). Wei also teaches a co-catalyst (gold) in order to act together with the titanium dioxide as an effective thermocatalyst for room temperature oxidation of carbon monoxide to carbon dioxide (paragraph 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the metal oxide photocatalyst and gold co-catalyst of Wei with the fluidized photocatalytic/oxidation reactor of Becker in order to destroy air contaminants and oxidize carbon monoxide to carbon dioxide at room temperature.

13. Claims 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969) and Li et al. (US 6,782,892) as applied to claim 1 above, and further in view of Sigai (US 4,585,673).

Regarding claims 18-20, the modified Becker discloses all of the claims limitations as discussed in claim 1 above, but does not teach a means for agitating the catalyst nanoparticles in the hollow interior region.

Sigai also discloses a fluidized bed chamber (Fig. 1 (15)).

Sigai teaches an agitation/vibrating/shaking system (Fig. 1 (17,19)) in order to fluidize a suspended solid (in this case, phosphor powder) and improve the expansion of the fluidized bed (col. 4 lines 46-50).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the agitation/shaking/vibrating means of Sigai with the fluidized bed oxidation reactor of Becker in order to fluidize the suspended solid and improve the expansion of the fluidized bed.

14. Claims 25, 27-30 and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368) in view of Zhou (US 6,500,969), Li et al. (US 6,782,892), Alford et al. (US 6,887,291) and Ballantine et al. (US 2006/0078771) and further evidenced by Kinkade (US 4,994,498).

Regarding claims 25, 27, 28, Becker discloses:

a fluidized-bed oxidation reactor comprising:

a chamber (Fig. 1 (1)) defining a hollow interior region and having a lower surface (4);

a first input (6) for introducing a gas into the hollow interior region;

a plurality of particles (2) within the hollow interior region and located on the lower surface (4), and;

a fluidizing input (10) for introducing a fluidizing material into the hollow interior region (gas, paragraph 32 lines 4-5), said fluidizing input having an outlet directed at the lower surface of the chamber (see Fig. 1 (10), paragraph 26 lines

3-5). The entry of gas into a bed of catalyst will fluidize at least a portion of an already fluidized bed.

Furthermore, regarding limitations which are directed to a manner of operating disclosed system, neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP §2114 and 2115. Further, process limitations do not have a patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim.

While Becker teaches the catalyst containing metal (paragraph [0032]) such as gold, Becker fails to teach the plurality of catalysts as being nanoparticles.

Zhou also discloses an oxidation process (as does Becker) and the type of catalyst used in said oxidation process.

Zhou teaches nanoparticles comprising a metal (col. 8 lines 33-43) being utilized as the catalyst in an oxidation reaction in order to ensure high activity and selectivity of desired oxidation products (col. 5 lines 34-43).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the nanoparticles of Zhou in the fluidized bed oxidation reactor of Becker in order to ensure high activity and selectivity of the desired oxidation products.

Modified Becker teaches nano-sized oxidation catalyst in the range of 0.5 to 100nm (see Zhou, claim 15), but is silent on particle sizes in the range of 15-25nm.

Li also discloses a nanosized oxidation catalyst.

Li teaches a nanocatalyst used for oxidation with a particle size of 25nm as a preferable way of oxidizing a reactant (col. 8 lines 55-61).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a particle diameter of 25nm, as in Li, in the catalyst of modified Becker as a known size of nanoparticle to oxidize a reactant.

Furthermore, regarding the size of the particles, it was well known in the art at the time of the invention that the particle size of the catalyst in a fluidized bed is a variable that is routinely varied to achieve the desired performance (see Kinkade, col. 7 lines 51-59). As such the size of the catalyst particles is not considered to confer patentability to the claim. The size of the particles would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the claimed size of the catalyst particles cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the size of the catalyst particles in modified Becker to obtain the desired fluidized bed performance (In re Boesch, 617 F. 2d. 272,205 USPQ 215 (CCPA 1980)). Since it has been held that where general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 223).

Also, the modified Becker discloses a fluidized catalyst (2) in a reaction bed with an exit port (8) for the gas that has reacted, but does not teach the claimed nanoparticle separation from the effluent gas method and apparatus comprising:

a second input for introducing a backpressure pulse of gaseous material into the hollow interior region through the port, or

a gas permeable separation device in communication with said port and the exit of gas from the hollow interior region through the gas permeable separation device for separating catalyst nanoparticles and causing them to collect upon the gas permeable separation device and where the entrance of the backpressure pulse displaces the collected catalyst nanoparticles.

Alford discloses a filter device for removing nanomaterials from gas streams using a gas permeable separating device (Fig.1 (2), see Abstract).

Alford teaches a second input (5) for introducing a backpressure pulse (pulse jet, which is triggered by an increase in pressure drop across the reactor, col. 8 lines 63-67) of gaseous material into a hollow interior region (10) (col. 7 lines 59-67) in order to clean a filter (col. 7 lines 43-55). Alford also teaches a gas permeable separation device (filter, 2) in communication with a hollow interior region (10) and the second input (5) and the entrance for introducing a backpressure pulse (pulse jet) into the hollow interior region (10) displacing collected catalyst nanoparticles (col. 7 lines 43-55). Alford teaches this in order to allow catalyst nanoparticles to be collected by said gas permeable

separation device (filter) and to clean said gas permeable separation device of said catalyst nanoparticles (col. 7 lines 35-67).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the backpressure pulse input of Alford with the fluidized bed oxidation reactor with nanoparticles of the modified Becker in order to clean the filter that is used to separate the nanoparticles from the gas stream with the second input. Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the gas permeable separation device (in communication with the second input) and the entrance of the backpressure pulse into the hollow interior region to displace the collected nanoparticles of Alford, with the fluidized bed oxidation reactor of the modified Becker in order to allow catalyst nanoparticles to be collected by said gas permeable separation device and to clean said gas permeable separation device of said catalyst nanoparticles.

Also, modified Becker, as discussed above, discloses a vessel with two 'competing inlets' (process inlet and fluidizing inlet, competing with backpressure pulse inlets). By the term 'competing inlets', the examiner is referring to two independent inlets that are injecting fluid into the same space. Modified Becker, however, does not disclose a specific control strategy utilized by a control device that synchronizes the backpressure pulse valve with the first input valve.

Ballantine discloses a series of controlled valves introducing multiple fluid inlets to the same process space.

Ballantine teaches a valve synchronization process of closing an inlet valve (402) connected to a vessel (412) when a second inlet valve (401) is opened in order to prevent backflow through the first process valve (paragraph 42)

It would have been obvious to one of ordinary skill in the art at the time of the invention to change the control scheme of the valve controller in modified Becker to synchronize the valve opening of the second inlet with the valve opening of the first inlet such that when the second inlet valve opens, the first inlet valve closes in order to prevent back flow through the first inlet valve, as is taught by Ballantine.

Regarding claim 29, modified Becker, as discussed in claim 25 above, discloses a gas permeable layer (4) within the hollow interior region of the chamber (see Fig. 1), the gas permeable layer having the plurality of catalyst nanoparticles thereon in a non-fluidized state (paragraph 32), but does not disclose the fluidizing input (10) at a 45 degree angle relative to the gas permeable layer (see Fig. 1).

However such modification is a mere rearrangement of the system parts that would not modify the operation of the system, and would have been obvious to one of ordinary skill in the art at the time of the invention. See In re Japikse, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950).

Regarding claim 30, modified Becker, as discussed in claim 25 above, further discloses product gas, exiting from the hollow interior region through the port, through the gas permeable separation device (as modified by Alford), and recycled back to the fluidizing inlet (see paragraph 32).

Regarding claims 32 and 33, modified Becker, as discussed in claim 30 above, teaches a filtration device (also called the gas permeable separation membrane) that is configured to detect a drop in pressure across the filter in order to assess the amount of catalyst particles that have collected on the boundary layer (see Alford, col. 8 lines 63-67, where pressure is detected and relayed) and relaying this information to the control device.

Modified Becker, however, does not discloses a second filtration device downstream of the first filtration device (gas permeable membrane) that is configured to generate a signal and relay it to the control device, however, providing a duplicate filtration device would amount to a mere duplication of parts. It has been held that mere duplication of parts has no patentable significance unless a new and unexpected result is produced. *In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960).

Regarding claim 34, modified Becker further discloses a gas source coupled to the second input (see Alford, 20) for providing the backpressure pulse, and a gas source (see 12 of Becker) coupled to the entrance of the fluidizing material into the hollow interior region (see inlet 10 of Becker).

15. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969), Li et al. (US 6,782,892), Alford et al. (US 6,887,291) and Ballantine et al. (US 2006/0078771) as applied to claim 25 above, and further evidenced by Breton et al. (US 3,997,447).

Regarding claim 26, modified Becker fails to teach the at least one control device is further configured to introduce the backpressure pulse of gaseous material through the gas permeable separation device for about 0.2 seconds and introduce at least one of the contaminated gas and the fluidizing material into the hollow interior region for about 0.8 seconds.

However, it was well known in the art at the time of the invention that the length and frequency of the backpressure pulses, has a significant effect on the performance and operation of a filter that utilizes this method of cleaning (see Breton col. 4 line 67 - col. 5 line 4 and col. 5 lines 36-49, where Breton discloses the preference for frequent backpulses in order to prevent buildup of catalyst on the boundary of a filter). As such, the timing of the backpulses is not considered to confer patentability to the claim, as the length and frequency of the backpulses is a variable that can be modified, as is taught by Breton, is considered a result effective variable. As such, without showing unexpected results, the claimed length of the backpressure pulses cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the length of the backpressure pulses modified Becker to obtain the desired mixing and flow distribution (In re Boesch, 617 F. 2d. 272,205 USPQ 215 (CCPA 1980)). Since it has been held that where general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 223).

16. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969), Li et al. (US 6,782,892), Alford et al. (US 6,887,291) and Ballantine et al. (US 2006/0078771) as applied to claim 30 above, and further in view of Choudhary et al. (US 5,936,135).

Regarding claim 31, modified Becker, as discussed in claim 30 above, fails to teach a flame ionization detector in communication between the decontaminated gas passage way and the fluidizing input, such that the decontaminated gas passes through the flame ionization detector to the fluidizing input.

Choudhary discloses a reactor for processing a combustible gas (such as propane, which is also taught by Becker, see paragraph 28 of Becker). Choudhary teaches a flame ionization detector at the outlet of the reactor in order to assess the quality and performance of the product gas and the reactor (col. 12 lines 26-34).

As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to add the gas chromatograph utilizing a flame ionization detector, as taught by Choudhary, in the recycle line of Becker in order to assess the quality and performance of the product gas and the reactor.

Response to Arguments

35 USC §103(a) Prior Art Rejections

17. Applicant's arguments filed 10/30/07 have been fully considered but they are not persuasive.

Applicant argues that Zhou teaches away from Becker and does not rectify the deficiencies of Becker. As stated on Page 11 of Applicant's reply,

> *"Zhou does not teach the fluidizing of nanoparticles and the creation of a gaseous dispersion. Thus, Zhou does not and cannot teach the use of fluidized nanoparticles that react with a contaminated gas to produce a decontaminated gas."*

And furthermore on page 12 states that,

> *"Zhou teaches away from the above mentioned oxidizing agents stating that such oxidizing agents are expensive, dangerous, and suffer from product selectivity problems."*

The examiner agrees with these arguments. However, as pointed out above, Becker was modified with Zhou merely for the implementation of catalyst nanoparticles as being a practice known well in the art to improve catalyst performance, and is not modified with the actual catalyst utilized in Zhou.

Conclusion

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J. Merkling whose telephone number is (571) 272-9813. The examiner can normally be reached on M-F 8:30-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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MJM

MJM

Alexa Neckel
ALEXA D. NECKEL
SUPERVISORY PATENT EXAMINER